

TITLE OF THE INVENTION

PAPER CASSETTE FOR PRINTING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 2003-38443, filed on June 13, 2003, in the Korean Intellectual Property Office, the disclosure of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a paper cassette for a printing apparatus.

2. Description of the Related Art

[0003] In general, a printing apparatus such as laser printer, color printer, copier, multi-function product or the like includes a paper feeding apparatus for feeding a paper into a printing area of the printing apparatus.

[0004] Such a paper feeding apparatus generally comprises a paper cassette and a pick-up unit for feeding a paper loaded in the cassette in one direction.

[0005] In Fig. 1, a conventional paper cassette comprises a cassette body 10 in a cabinet type, within which a plurality of papers are contained, a paper arranging guide 11 for arranging trailing edges of the papers in order while moving in a horizontal direction along the bottom of the cassette body 10, and a guide plate 13 installed on an inner side of the cassette body 10, wherein the leading edges of the papers come into contact with the guide plate 13.

[0006] The paper pick-up unit comprises a pick-up lever 21 installed above the cassette body 10 to be pivotable within a predetermined range of angle, and a pick-up roller 23 provided at an end of the pick-up lever 21 to be rotationally driven. When the pick-up lever 21 is pivoted and lowered due to its weight and the weight of the pick-up roller 23, the pick-up roller 23 contacts

with the top of the papers loaded in the cassette body 10. When the pick-up roller 23 is rotationally driven in this state, the uppermost paper is picked up by the pick-up roller 23. Then, papers having leading edges in contact with the guide plate 13, are separately fed sheet by sheet due to frictional force produced by such a contact. The operation of separating and picking up the papers depends on the angle in which the guide plate 13 contacts with the leading edges of the papers and a paper feeding force generated by the rotation of the pick-up roller 23. Therefore, the distance A between the contact area of the pick-up roller 23 and the paper and the guide plate 13 is a very important design factor.

[0007] With the above construction, the height of the papers is lowered as the papers are being picked-up and fed, the pick-up lever 21 will be pivoted downward and the pick-up roller 23 will be displaced as indicated by phantom lines. As a result, the distance B between the pick-up roller 23 and the guide plate 13 is larger than distance A. Thus, when the pick-up roller 23 rotates and feeds a paper, the paper may not be picked up accurately because the leading edge of the paper may be wrinkled or deformed. In addition, as static electricity and frictional force between papers increase in proportion to the distance B, occasionally two or more papers may be picked up concurrently and fed into a printing area.

[0008] Further, if the inclined angle of the guide plate 13 is increased to prevent two or more papers from being picked up as described above, a large resistant force is applied to the leading edges of the papers, therefore problems may exist when picking up the papers.

SUMMARY OF THE INVENTION

[0009] Accordingly, it is an aspect of the present invention to provide a paper cassette for a printing apparatus capable of picking up paper accurately regardless of the position of the pick-up roller.

[0010] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0011] The foregoing and/or other aspects of the present invention are achieved by providing a paper cassette for a printing apparatus including a pick-up lever having pick-up roller at one end thereof to be movable in the paper cassette, the paper cassette comprising a cassette body to

load papers therein to be picked up by the pick-up roller, a paper arranging guide member installed to be movable in the cassette body and arranging trailing edges of the papers in a predetermined form, and a guide plate provided in a side of the cassette body to be opposite to the guide member to provide a predetermined frictional resistance for a leading edge of a paper to be picked up by the pick-up roller, and having a guide surface formed in a predetermined shape, wherein a constant distance between the guide plate and the pick-up roller is maintained along a moving trace of the pick-up lever.

[0012] The guide surface comprises a curved surface having a predetermined curvature.

[0013] A center of the predetermined curvature of the guide surface corresponds to a pivot center of the pick-up lever.

[0014] The paper arranging guide member comprises a support surface corresponding to the guide surface of the guide plate.

[0015] In addition, it is another aspect of the present invention to provide a paper cassette for a printing apparatus comprising a cassette body to load papers therein to be picked up by the pick-up roller, a guide member installed to be movable in the cassette body and arranging trailing edges of the papers, and a guide plate provided in a side to be opposite to the guide member to provide a predetermined frictional resistance for leading edges of papers to be picked up by the pick-up roller, wherein the guide plate comprises guide surface having at least two contact angles in relation to the horizontal direction of the papers.

[0016] The guide surface comprises a first slope which forms a first angle with respect to the leading edges of the papers loaded in the cassette body contacts with the first slope, and a second slope interconnecting the first slope and the bottom surface of the cassette body, wherein the second slope forms a second angle with respect to the leading edges of the papers loaded in the cassette body and contacts with the second slope.

[0017] In addition, the first slope comprises a greater inclination than the second slope.

[0018] Further, a boundary between the first slope and the second slope is positioned at a height corresponding to approximately a half of a paper loading capacity of the cassette body.

[0019] The paper cassette further comprises a friction pad installed on one of the first and second slopes to provide a frictional resistance when the leading edges of the papers contact with the friction pad.

[0020] The friction pad is attached on the second slope which interconnects the bottom surface of the cassette body and the first slope and has a smaller inclination than the first slope.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] These and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

Fig. 1 is a schematic view illustrating a conventional paper cassette for a printing apparatus;

Fig. 2 is a schematic view illustrating a paper cassette for a printing apparatus according to a first embodiment of the present invention;

Fig. 3 is a schematic view illustrating a paper cassette for a printing apparatus according to a second embodiment of the present invention; and

Figs. 4 is a schematic view illustrating a paper cassette for a printing apparatus according to a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0023] In to Fig. 2, the paper cassette according to a first embodiment of the present invention, comprising a cassette body 40, to load papers P therein to be picked up by a pick-up roller 23, a paper arranging guide member 50 to arrange trailing edges of the papers P, and a guide plate 60 for providing a frictional resistance to leading edges of the papers to be picked up by the pick-up roller 23.

[0024] The pick-up roller 23 is rotatably installed at an end of a pick-up lever 21, which is installed in a printer body 30 to be pivotable within a range of angle. The pick-up roller 23 is rotated by receiving power through a power transmission mechanism (not shown), and contacts with and picks up an uppermost paper among the loaded papers P. Here, the pick-up lever 21 is pivotable up and down about a pivot axle 21a connected to the printer body 30. After the cassette body 40 is installed in the printer body 30, the pick-up lever 21 is lowered due to its weight and the weight of the pick-up roller 23 and the pick-up roller 23 contacts with the papers P. The construction and operation of the pick-up lever 21 and the pick-up roller 23 are well known in the art of printing apparatus and thus detailed description thereof is omitted.

[0025] The cassette body 40 is removably installed in the printer body 30. The cassette body 40 is typically capable of being loaded with several hundreds of papers P. A sidewall inside the cassette body 40 is formed inclined in an angle capable of supporting the guide plate 60.

[0026] The paper arranging guide member 50 is installed to slidably move in a horizontal direction along the bottom of the cassette body 40. The paper arranging guide member 50 arranges trailing edges of the papers P in a predetermined form. The paper arranging guide member 50 arranges the trailing edges of the papers P to correspond to the shape of the guide plate 60. Therefore, the paper support surface 51 of the paper arranging guide member 50 comprises a shape complementary to that of the paper guide surface 61 of the guide plate 60. In this embodiment, the paper support surface 51 comprises a curved surface with a predetermined curvature radius.

[0027] The lower end of the guide plate 60 is fixed to the bottom of the cassette body 40 and the upper end is fixed to the upper end of the cassette body 40. The guide surface 61 provided on the guide plate 60 maintains a constant spacing in relation to the pick-up roller 23 in the paper feeding direction, i.e., in relation to the horizontal direction of the papers as the pick-up roller is moved. Therefore, the guide surface 61 comprises a curved surface having a predetermined curvature radius. A center of the predetermined curvature of the guide surface 61 corresponds to a pivot center of the pick-up lever 21 and the predetermined curvature radius of the guide surface 61 is larger than a pivot radius of the pick-up lever 21 about a pivot axle 21a. A sidewall inside of the cassette body 40 comprises a rounded engaging surface 41 capable of supporting the guide plate 60. When the guide plate 60 is installed on the engaging surface 41 to be tightly contacted therewith, it is possible to prevent the guide plate 60 from

being deformed by repeated compressive forces applied by the papers as being picked up. Therefore, the guide plate 60 is formed of a metallic material to minimize the wear caused friction.

[0028] The paper support surface 51 of the paper arranging guide member 50 comprises a curved surface having a curvature radius relative to that of the guide surface 61. Therefore, the trailing and leading edges of the papers P loaded within the cassette body 40 are roundly arranged and supported by the paper support surface 51 and the guide surface 61.

[0029] According to this construction, the distance between the pick-up roller 23 and the guide surface 61 may be constantly maintained even if the pick-up roller 23 is lowered due to its weight and its position is changed as the papers P are continuously picked up and fed by pick-up roller and thus the quantity of the papers P is reduced. That is, even if the position of the pick-up roller 23 is gradually changed as indicated by phantom lines in Fig. 2, the distance A (shown in FIG. 3) is constantly maintained. Accordingly, it is possible to pick up all the papers from the uppermost paper to the lowermost paper with a constant pick-up force. Further, because the frictional resistance applied to the leading edges of the papers is constantly maintained, it is possible to normally feed papers sheet by sheet. Since the distance A is constantly maintained, it is possible to prevent two or more papers from being concurrently picked up.

[0030] In Fig. 3, the paper cassette for a printing apparatus according to a second embodiment of the present invention comprises a cassette body 140 to load papers P therein, a paper arranging guide member 150 slidably installed within the cassette body 140, and a guide plate 160 installed on a sidewall within the cassette body 140 to face with the guide member 150.

[0031] The construction of the cassette body 140 is similar to that of the cassette body 40 shown in Fig. 2. However, the engaging surface 141 for supporting the guide plate 160 is different from the engaging surface 41 of the cassette body 40 in shape. The engaging surface 141 has a shape corresponding to that of the guide plate 160 to be described later.

[0032] The papers loaded in the cassette body 140 are picked up by a pick-up unit including the pick-up roller 23 and the pick-up lever 21.

[0033] The one end of the guide plate 160 is fixed to the bottom of the cassette body 140 and the other end is fixed to the top end of a side of the cassette body 140. The guide plate 160 is provided with a guide surface, or an inclined surface 161 having a predetermined inclined angle in relation to the horizontal direction of the papers contacting with the inclined surface 161. The inclined surface 161 has two or more contact angles in relation to the horizontal direction of the papers P contacted with the inclined surface 161.

[0034] Specifically, the inclined surface 161 comprises a first slope 161a formed in the upper part of the inclined surface 161 and a second slope 161b formed below the first slope 161a. The first slope 161a is formed in such a way that it is inclined to form a first angle $\Theta 1$ in relation to the horizontal direction of the papers loaded in the cassette body 140 and contacting with the first slope. The second slope 161b is provided between the first slope 161a and the bottom surface 143 of the cassette body 140. The second slope 161b is inclined to form a second angle $\Theta 2$ in relation to the horizontal direction of the papers loaded in the cassette body 140 and contacting with the second slope 161b. Here, the second angle $\Theta 2$ is larger than the first angle $\Theta 1$. Therefore, the first slope 161a comprises a greater inclination than the second slope 161b. In addition, in reference to the paper loading capacity of the cassette body 140, the boundary 161c between the first and second slopes 161a and 161b is located at a height corresponding to approximately a half of paper loading capacity of the cassette body. That is, when the maximum paper loading capacity of the cassette body 140 is of approximately 500 sheets of papers, for example, the boundary 161c is provided at the height corresponding to approximately 250 sheets of papers from the bottom surface of the cassette body 140.

[0035] The paper arranging guide member 150 comprises a paper support surface 151 with a shape complementary to that of the inclined surface 161. In addition, the paper support surface 151 comprises first and second support surfaces 151a and 151b corresponding to the first and second slopes 161a, 161b, respectively. Therefore, the leading edges of the papers P, of which trailing edges have been pushed and arranged by the support surface 151 of the guide member 150, contact with the inclined surface 161, thereby being supported.

[0036] As described above, since the guide plate 160 comprises two slopes 161a and 161b, a distance between the pick-up roller 23 and the guide plate 160 is unchanged even if the papers P are gradually consumed and the position of the pick-up roller 23 is changed as indicated by the phantom lines. That is, the distance A between the pick-up roller 23 and the guide plate 160

is remained unchanged regardless of the positional change of the pick-up roller 23. Therefore, the papers P receive a constant force, to be separated and fed to a printing area sheet by sheet. And, it is possible to prevent two or more papers from being concurrently fed, whereby a pick-up operation can be normally performed.

[0037] In Fig. 4, the paper cassette according to a third embodiment of the present invention comprises a friction pad 170 provided on the inclined surface 161 of the guide plate 160. The friction pad 170 is attached on the second slope 161b. The friction pad 170 is provided on the second slope 161b, which comprises a smaller inclination than the first slope 161a therefore, it is possible to compensate for the decrease of frictional resistance applied to the leading edges of the papers. As a result, it is possible to prevent two or more papers from being picked up and fed to a printing area. The friction pad 170 is formed of a urethane material or a rubber material.

[0038] As described above, since the paper cassette for a printing apparatus according to the present invention, includes a guide surface of a guide plate which provides a frictional resistance for leading edges of papers to be picked up is formed with a curved surface or two slopes, it is possible to maintain a constant distance between the guide plate and a pick up roller regardless of the positional change of the pick-up roller. Therefore, it is possible to effectively prevent a paper from being poorly picked up or two or more papers from being concurrently picked up, thereby enhancing a printing quality.

[0039] In particular, by installing a friction pad on a lowermost slope among a plurality of slopes of the guide plate, the possibility of picking up two or more papers can be substantially reduced.

[0040] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.